

Endpoints are selected based on general cleanup objectives, which are to: 1) minimize exposure hazards for human health; 2) speed recovery of impacted areas if possible; and 3) reduce the threat of additional or prolonged natural resource impacts. These objectives lead to developing cleanup strategies that do not cause more harm to the environment than good.

Guidelines for development of Cleanup Endpoints

No product remains in the damaged tanks or in secondary containment in the tank farm, damaged tanks will be rinsed once and no detectable vapors remain: Not Detectable by visual inspection and real time air monitoring:

- This endpoint is often used to determine if all product and firewater has been recovered.
- Visual inspections will be performed by Unified Command.

No Longer Generates Sheens that Will Affect Sensitive Areas, Wildlife, or Human Health:

- This endpoint is used where sheening persists after cleanup efforts become ineffective, or on sensitive habitats where further cleanup efforts will cause more harm than natural removal. Residual sheening should persist over a relatively short time period.
- Sheen is an oil film ranging from barely visible to dull colors. Sorbents effectiveness is usually limited in recovery of sheens. Consider the amount and duration of sheening, and the distance to sensitive resources, to determine if sheening poses a significant threat.
- Consider the degree of exposure: high wave/tidal exposure speeds removal and breaks up sheens; sheltered areas will sheen longer and sheens will be more persistent.
- Consider the degree and timing of use: sheening may be tolerated in areas or during periods of low use; even minor sheens may not be tolerated in areas of high use, such as popular subsistence areas.

No Longer Rubs Off on Contact:

- This endpoint is usually defined as oil removal to a stain or coat, or weathering to the point that it is no longer sticky. It is applied to hard substrates (rocky shores, gravel) and vegetation (kelp).
- The objective is to prevent oiling of fur, feathers, and feet of wildlife, and oiling of people and property during contact with oiled surfaces.
- Consider the degree and timing of use: high-use areas often require higher cleanliness, whereas natural removal is allowed in low-use areas where further cleanup efforts will be disruptive.

Oil Removal to Allow Recovery/recolonization Without Causing More Harm than Natural Removal of Oil Residues:

- This endpoint is used where further oil removal will result in excessive habitat disruption (e.g., trampling of soft sediments, mixing oil deeper, extensive sediment removal, vegetation cutting) or high biota mortality (e.g., from high-pressure, hot-water washing of intertidal communities).
- It is also used for areas with difficult access, which limits the type of cleanup that can be conducted along that shoreline segment.

- Consider the potential for erosion from excessive sediment removal, particularly where erosion/deposition patterns of the beach cycle will re-work and clean sediments within an acceptable time frame.

Cleanup Endpoints and Trade-off Issues by ESI Shoreline Type

Solid Man-Made Structures (ESI = 1B) Pier Pilings:

Cleanup Trade-off Issues

- The pier pilings are vintage creosote-treated pilings and are therefore a chronic source of pollutants or habitat degradation, and have low biological sensitivity.
- [Is this a public use area? Do we need to be concerned with exposure to the public?]
- The lower part of the structure is not particularly rich with attached biota and would therefore not need to be protected during manual scraping or high-temperature, high-pressure flushing.

Cleanup Endpoints

- No accessible oiled debris.
- (If public use is not a concern) no longer generates oil greater than sheens. (If this is a public access area) no longer generates sheens.
- No surface oil greater than 20% Coat or Stain. (In areas of high public use or visibility) no surface oil greater than 10% Coat or Stain.

Mixed Sand and Gravel Beaches (ESI = 5) and Gravel Beaches (ESI = 6A)

Cleanup Trade-off Issues

- Beaches with a significant amount of gravel are relatively difficult to clean because they have high potential for deep penetration and burial. Deeply penetrated oil can be a chronic source of remobilized oil for months or longer.
- Natural replenishment rates of gravel are slow, so sediment removal is usually minimized and sediment reworking or natural removal considered after gross oil removal is completed.
- The most difficult issue is removal of persistent, deeply penetrated oil because of the degree of physical disruption to both the beach profile and sediment distribution patterns. It is difficult to predict how long natural removal at a specific site will take.
- Gravel is mobilized mostly during storms, so it could take months to years for a coarse gravel beach to return to normal after extensive physical disruption.

Cleanup Endpoints

- No surface oil more than 20% Coat or Stain on the gravel-sized sediments, and subsurface oil no more than 5% Oil Residue.

Sheltered Rocky Shores (ESI = 8A)

Cleanup Trade-off Issues

- Oil will adhere readily to the rough, rocky surface, forming a distinct band along/above the high tide line. Low- to high-pressure spraying at ambient water temperatures is most effective when the oil is fresh. In low public use or remote areas, wiping with sorbents until the oil no longer rubs off will leave a visible coat, but reduces the logistics and amount of equipment for cleanup, especially where access is difficult.
- It is extremely difficult to completely remove oil from crevices and undersides of the boulder/cobble rubble because they are inaccessible. With higher residues remaining, they can release sheens for weeks or longer.

- Where the rubble is loosely packed, oil will penetrate deeply, causing long-term contamination of the subsurface sediments. May consider limited removal of persistent residues that are affecting sensitive resources such as the rich biological communities of the lower intertidal zone. Low- to high-pressure spraying at ambient water temperatures is most effective when the oil is fresh. Care must be taken not to spray algae or other plants and attached fauna (exception below).
- *Fucus* is present in much of the mid- to lower- intertidal range. Under heavy oiling conditions with such a viscous oil, *Fucus* probably will die back but will likely recover to comparable levels of abundance and cover in nearby unoiled areas within 1 to 3 years. Cutting the more heavily oiled *Fucus* will remove a source of oil and recovery rates will be similar if no cutting is employed. Pressure washing with ambient water is also an option; however, it should be noted when considering either cutting or pressure washing that *Fucus* provides cover for animals underneath that could be removed during high-pressure flushing.

Cleanup Endpoints

- No accessible oiled debris.
- No surface oil greater than 20% Stain or Coat on solid surfaces.
- On rocky shores where marine mammals haul out or migratory birds feed or loaf, persistent oil should be removed until the oil no longer rubs off on contact and the shoreline no longer generates sheens that affect sensitive wildlife.

Large Debris (e.g., Logs, Abandoned Buildings) Excluding Historic/Cultural Items

Cleanup Trade-off Issues

- Large pieces of debris are difficult to remove and generate large volumes of waste for transport and disposal.
- Oil on the debris generally weathers to a dry coat within weeks, after which it is a lower threat of oiling wildlife.
- Only the more heavily oiled parts of the debris should be removed (if they can be separated), leaving behind less oiled parts.

Cleanup Endpoints

- No surface oil greater than 20% Stain or Coat.
- No oil on surfaces that can rub off on contact.
- Do not remove any unoiled natural debris.